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Osamu Shinkawa

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EXAMINER

GOLDBERG, BRIAN J

ART UNIT

PAPER NUMBER

2861

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/807,920	Applicant(s) SHINKAWA, OSAMU	
	Examiner Brian Goldberg	Art Unit 2861	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 November 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 November 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 3/24/04, 10/14/04
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the **pulse generating means** must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The abstract of the disclosure is objected to because of the inclusion of "45" after "subtraction counter" in line 12. Correction is required. See MPEP § 608.01(b).

Claim Objections

3. Claims 1-27 are objected to because of the following informalities:

4. Claim 1 recites the limitations "the number of reference pulses" in line 16 of the claim and "the count value" in the second to last line of the claim. There is insufficient antecedent basis for these limitations in the claim.

5. Claim 2 recites the limitation "the droplet" in line 4 of the claim. There is insufficient antecedent basis for this limitation in the claim.

6. Claims 3 and 4 recite the limitation "the residual vibration" in line 3 of the claims. There is insufficient antecedent basis for this limitation in the claims.

7. Claim 7 recites the limitation "the outlet" in line 4 of the claim. There is insufficient antecedent basis for this limitation in the claim.

8. Claim 8 recites the limitation "the subtraction result" in lines 5-6 of the claim. There is insufficient antecedent basis for this limitation in the claim.

9. Claim 12 recites the limitation "the detection result" in lines 2-3 of the claim. There is insufficient antecedent basis for this limitation in the claim.

10. Claim 14 recites the limitation "the residual vibration" in line 5 of the claim. There is insufficient antecedent basis for this limitation in the claim.

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11. Claim 22 recites the limitations "the number of reference pulses" in line 13 of the claim and "the count value" in the second to last line of the claim. There is insufficient antecedent basis for these limitations in the claim.

12. Claim 23 recites the limitations "the residual vibration" in line 3 of the claim and "the droplet" in line 4 of the claim. There is insufficient antecedent basis for these limitations in the claim.

13. Claim 25 recites the limitations "the number of reference pulses" in line 11 of the claim and "the count value" in the last line of the claim. There is insufficient antecedent basis for these limitations in the claim.

14. Claim 26 recites the limitation "the subtraction result" in lines 6-7 of the claim. There is insufficient antecedent basis for this limitation in the claim.

15. Claim 27 recites the limitations "the number of reference pulses" in line 10 of the claim and "the count value" in the last line of the claim. There is insufficient antecedent basis for these limitations in the claim.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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17. Claims 1, 12, 19, 21, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. (US 5975668) in view of Takazawa et al. (US 20020018090).

18. Regarding claim 1, Fujii et al. disclose “a diaphragm (5 of Fig 1); an actuator which displaces the diaphragm (27 of Fig 5); a cavity filled with a liquid (6 of Fig 1), an internal pressure of the cavity being increased and decreased in response to displacement of the diaphragm (col 14 ln 54-56); and a nozzle communicated with the cavity (4 of Fig 1), through which the liquid is ejected in the form of droplets in response to the increase and decrease of the internal pressure of the cavity (col 14 ln 54-56); a driving circuit which drives the actuator of each droplet ejection head (40 of Figs 1, 6, 7A, 102 of Fig 9A, Fig 27); pulse generating means for generating reference pulses (63 of Fig 6); a counter for counting the number of reference pulses generated for a predetermined time period (91 of Fig 28).” Thus Fujii et al. meet the claimed invention except “ejection failure detecting means for detecting an ejection failure of the droplets on the basis of the count value of the counter counted for the predetermined time period.”

19. Takazawa et al. teach “ejection failure detecting means for detecting an ejection failure of the droplets on the basis of the count value of the counter counted for the predetermined time period (741, Par [0101], Fig 5).” It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to include ejection failure detecting means. One would have been motivated to modify Fujii et al. for the

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benefit of having the ability to detect and correct errors in order to achieve a more accurate and reliable printing system.

20. Regarding claim 12, Fujii et al. disclose "storage means for storing the detection result detected by the ejection failure detecting means (75 of Fig 21, 92 of Fig 28)."

21. Regarding claim 19, Fujii et al. disclose "the actuator includes an electrostatic actuator (see abstract, ln 2)."

22. Regarding claim 21, Fujii et al. disclose "wherein the droplet ejection apparatus includes an ink jet printer (see Fig 33)."

23. Regarding claim 25, Fujii et al. disclose "carrying out a droplet ejection operation in which a liquid in the cavity (6 of Fig 1) is ejected through the nozzle (4 of Fig 1) in the form of droplets by displacement of the diaphragm by driving the actuator (27 of Fig 5, col 14 ln 54-56); generating reference pulses (63 of Fig 6) and measuring a predetermined time period after the droplet ejection operation (col 5 ln 56-67); counting (91 of Fig 28) the number of reference pulses generated for the measured predetermined time period." Thus Fujii et al. meet the claimed invention except "detecting an ejection failure of the droplets on the basis of the count value in the counting step."

24. Takazawa et al. teach "detecting an ejection failure of the droplets on the basis of the count value in the counting step (741, Par [0101], Fig 5)." It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to include an ejection failure detecting step. One would have been motivated to modify

Fujii et al. for the benefit of having the ability to detect and correct errors in order to achieve a more accurate and reliable printing system.

25. Claims 1, 2, 5, 12, 21, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. in view of Nishihara (US 2002014450).

26. Regarding claims 1, 2, and 5 Fujii et al. disclose "a diaphragm (5 of Fig 1); an actuator which displaces the diaphragm (27 of Fig 5); a cavity filled with a liquid (6 of Fig 1), an internal pressure of the cavity being increased and decreased in response to displacement of the diaphragm (col 14 ln 54-56); and a nozzle communicated with the cavity (4 of Fig 1), through which the liquid is ejected in the form of droplets in response to the increase and decrease of the internal pressure of the cavity (col 14 ln 54-56); a driving circuit which drives the actuator of each droplet ejection head (40 of Figs 1, 6, 7A, 102 of Fig 9A, Fig 27); pulse generating means for generating reference pulses (63 of Fig 6); a counter for counting the number of reference pulses generated for a predetermined time period (91 of Fig 28)." Thus Fujii et al. meet the claimed invention except "ejection failure detecting means for detecting an ejection failure of the droplets on the basis of the count value of the counter counted for the predetermined time period" and "wherein the predetermined time period is a time period until a residual vibration of the diaphragm displaced by the actuator is generated after the droplet has been normally ejected from the droplet ejection head" and "the ejection failure detecting means detects presence or absence of the ejection failure by comparing a normal count range of the reference pulses when a droplet is normally ejected by the driving of the actuator with a count value of the counter counted for the predetermined time period."

27. Regarding claim 1, Nishihara teaches "ejection failure detecting means for detecting an ejection failure of the droplets on the basis of the count value of the counter counted for the predetermined time period (212, 213 of Fig 10, Par [0155], [0156])." Regarding claim 2, Nishihara teaches "wherein the predetermined time period is a time period until a residual vibration of the diaphragm displaced by the actuator is generated after the droplet has been normally ejected from the droplet ejection head (Par [0012], [0130])." Regarding claim 5, Nishihara teaches "the ejection failure detecting means detects presence or absence of the ejection failure by comparing a normal count range of the reference pulses when a droplet is normally ejected by the driving of the actuator with a count value of the counter counted for the predetermined time period (Par [0155], [0156])." It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to include ejection failure detecting means. One would have been motivated to modify Fujii et al. for the benefit of having the ability to detect and correct errors in order to achieve a more accurate and reliable printing system.

28. Regarding claim 12, Fujii et al. further disclose "storage means for storing the detection result detected by the ejection failure detecting means (75 of Fig 21, 92 of Fig 28)."

29. Regarding claim 21, Fujii et al. further disclose "wherein the droplet ejection apparatus includes an ink jet printer (see Fig 33)."

30. Regarding claim 25, Fujii et al. disclose "carrying out a droplet ejection operation in which a liquid in the cavity (6 of Fig 1) is ejected through the nozzle (4 of Fig 1) in the

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form of droplets by displacement of the diaphragm by driving the actuator (27 of Fig 5, col 14 ln 54-56); generating reference pulses (63 of Fig 6) and measuring a predetermined time period after the droplet ejection operation (col 5 ln 56-67); counting (91 of Fig 28) the number of reference pulses generated for the measured predetermined time period.” Thus Fujii et al. meet the claimed invention except “detecting an ejection failure of the droplets on the basis of the count value in the counting step.”

31. Nishihara teaches “detecting an ejection failure of the droplets on the basis of the count value in the counting step (212, 213 of Fig 10, Par [0155], [0156]).” It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to include an ejection failure detecting step. One would have been motivated to modify Fujii et al. for the benefit of having the ability to detect and correct errors in order to achieve a more accurate and reliable printing system.

32. Claims 2-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. in view of Takazawa et al. and further in view of Fujii et al. (US 20010007460).

33. Regarding claims 2-4, Fujii et al. in view of Takazawa et al. discloses the claimed invention as set forth above with respect to claim 1. Thus Fujii et al. in view of Takazawa et al. meet the claimed invention except “wherein the predetermined time period is a time period until a residual vibration of the diaphragm displaced by the actuator is generated after the droplet has been normally ejected from the droplet ejection head” and “wherein the predetermined time period is a time period corresponding to a first half [or one] cycle of the residual vibration.”

34. Fujii et al. teach “wherein the predetermined time period is a time period until a residual vibration of the diaphragm displaced by the actuator is generated after the droplet has been normally ejected from the droplet ejection head (Par [0107])” and “wherein the predetermined time period is a time period corresponding to a first half [or one] cycle of the residual vibration (Par [0107]).” It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to have the predetermined time period be a time period until residual vibration. One would have been motivated to modify Fujii et al. in view of Takazawa et al. for the benefit of ensuring that the printing system operates efficiently and that ink droplets can be formed stably resulting in a higher quality printer as set forth by Fujii et al. in paragraphs [0107] and [0108].”

35. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. in view of Takazawa et al. and further in view of Ishinaga et al. (US 20020149657). Fujii et al. in view of Takazawa et al. disclose the claimed invention as set forth above with respect to claim 1. Thus Fujii et al. in view of Takazawa et al. meet the claimed invention except “the ejection failure detecting means detects presence or absence of the ejection failure by comparing a normal count range of the reference pulses when a droplet is normally ejected by the driving of the actuator with a count value of the counter counted for the predetermined time period.”

36. Ishinaga et al. teach “the ejection failure detecting means detects presence or absence of the ejection failure by comparing a normal count range of the reference pulses when a droplet is normally ejected by the driving of the actuator with a count value of the counter counted for the predetermined time period (Par [0201] – [0203]).” It

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would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to include ejection failure detecting means using a comparison. One would have been motivated to modify Fujii et al. in view of Takazawa et al. for the benefit of having the ability to detect and correct errors in order to achieve a more accurate and reliable printing system.

37. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. in view of Takazawa et al. and Ishinaga et al. and further in view of Kawamura (US 4577203). Fujii et al. in view of Takazawa et al. and Ishinaga et al. disclose the claimed invention as set forth above with respect to claim 5. Thus Fujii et al. in view of Takazawa et al. and Ishinaga et al. meet the claimed invention except "the ejection failure detecting means judges that an air bubble has been intruded into the cavity as a cause of the ejection failure in the case where the count value is smaller than the normal count range."

38. Kawamura teaches "the ejection failure detecting means judges that an air bubble has been intruded into the cavity as a cause of the ejection failure in the case where the count value is smaller than the normal count range (col 3 ln 65 – col 4 ln 8)." It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to include judging that an air bubble exists in the cavity as a cause of error. One would have been motivated to modify Fujii et al. in view of Takazawa et al. and Ishinaga et al. for the benefit of determining a cause of error to be corrected in order to create a more robust and higher quality error detection system that not only detects, but also identifies an error cause.

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39. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. in view of Takazawa et al. and Ishinaga et al. and further in view of Yamaguchi et al. (US 5379061). Fujii et al. in view of Takazawa et al. and Ishinaga et al. disclose the claimed invention as set forth above with respect to claim 5. Thus Fujii et al. in view of Takazawa et al. and Ishinaga et al. meet the claimed invention except “the ejection failure detecting means judges that an air bubble has been intruded into the cavity as a cause of the ejection failure in the case where the count value is smaller than the normal count range.”

40. Yamaguchi et al. teach “the ejection failure detecting means judges that an air bubble has been intruded into the cavity as a cause of the ejection failure in the case where the count value is smaller than the normal count range (col 6 ln 26-33).” It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to include judging that an air bubble exists in the cavity as a cause of error. One would have been motivated to modify Fujii et al. in view of Takazawa et al. and Ishinaga et al. for the benefit of determining a cause of error to be corrected in order to create a more robust and higher quality error detection system that not only detects, but also identifies an error cause.

41. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. in view of Takazawa et al. and Ishinaga et al. and further in view of Noyes et al. (US 6364452) and Yamaguchi et al. Fujii et al. in view of Takazawa et al. and Ishinaga et al. disclose the claimed invention as set forth above with respect to claim 5. Thus Fujii et al. in view of Takazawa et al. and Ishinaga et al. meet the claimed invention except “the

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ejection failure detecting means judges that the liquid in the vicinity of the nozzle has thickened due to drying or that paper dust is adhering in the vicinity of the outlet of the nozzle as a cause of the ejection failure in the case where the count value is larger than the normal count range.”

42. Noyes et al. teach “the ejection failure detecting means judges that the liquid in the vicinity of the nozzle has thickened due to drying... (col 80 ln 12-23).” Yamaguchi et al. teach “...paper dust is adhering in the vicinity of the outlet of the nozzle as a cause of the ejection failure... (col 5 n 45-57).” It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to include judging that liquid has thickened or paper dust is adhering to the nozzle as a cause of error. One would have been motivated to modify Fujii et al. in view of Takazawa et al. and Ishinaga et al. for the benefit of determining a cause of error to be corrected in order to create a more robust and higher quality error detection system that not only detects, but also identifies an error cause.

43. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. in view of Takazawa et al. and Ishinaga et al. and further in view of Fujii (US 6299277) and Yamaguchi et al. Fujii et al. in view of Takazawa et al. and Ishinaga et al. disclose the claimed invention as set forth above with respect to claim 5. Thus Fujii et al. in view of Takazawa et al. and Ishinaga et al. meet the claimed invention except “the ejection failure detecting means judges that the liquid in the vicinity of the nozzle has thickened due to drying or that paper dust is adhering in the vicinity of the outlet of the nozzle as a

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cause of the ejection failure in the case where the count value is larger than the normal count range.”

44. Fujii teaches “the ejection failure detecting means judges that the liquid in the vicinity of the nozzle has thickened due to drying... (col 2 ln 5-27).” Yamaguchi et al. teach “...paper dust is adhering in the vicinity of the outlet of the nozzle as a cause of the ejection failure... (col 5 n 45-57).” It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to include judging that liquid has thickened or paper dust is adhering to the nozzle as a cause of error. One would have been motivated to modify Fujii et al. in view of Takazawa et al. and Ishinaga et al. for the benefit of determining a cause of error to be corrected in order to create a more robust and higher quality error detection system that not only detects, but also identifies an error cause.

45. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. in view of Takazawa et al. and further in view of Nishida et al. (US 20030146742). Fujii et al. in view of Takazawa et al. disclose the claimed invention as set forth above with respect to claim 1. Thus Fujii et al. in view of Takazawa et al. meet the claimed invention except “the counter subtracts the number of reference pulses counted for the predetermined time period from a predetermined reference value, and the ejection failure detecting means detects the ejection failure on the basis of the subtraction result.”

46. Nishida et al. teach “the counter subtracts the number of reference pulses counted for the predetermined time period from a predetermined reference value, and

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the ejection failure detecting means detects the ejection failure on the basis of the subtraction result (Par [0204]).” It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to include a subtraction capability of the counter as the basis for detecting the error. One would have been motivated to modify Fujii et al. in view of Takazawa et al. for the benefit of creating a more robust and higher quality sensing system by using a reference as a “normal”.

47. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. in view of Takazawa et al. and Nishida et al. and further in view of Kawamura. Fujii et al. in view of Takazawa et al. and Nishida et al. disclose the claimed invention as set forth above with respect to claim 8. Thus Fujii et al. in view of Takazawa et al. and Nishida et al. meet the claimed invention except “the ejection failure detecting means judges that an air bubble has intruded into the cavity as a cause of the ejection failure in the case where the subtraction result is smaller than a first threshold.”

48. Kawamura teaches “the ejection failure detecting means judges that an air bubble has been intruded into the cavity as a cause of the ejection failure in the case where the count value is smaller than a first threshold (col 3 ln 65 – col 4 ln 8).” It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to include judging that an air bubble exists in the cavity as a cause of error. One would have been motivated to modify Fujii et al. in view of Takazawa et al. and Nishida et al. for the benefit of determining a cause of error to be corrected in order to create a more robust and higher quality error detection system that not only detects, but also identifies an error cause.

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49. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. in view of Takazawa et al. and Nishida et al. and further in view of Yamaguchi et al. Fujii et al. in view of Takazawa et al. and Nishida et al. disclose the claimed invention as set forth above with respect to claim 8. Thus Fujii et al. in view of Takazawa et al. and Nishida et al. meet the claimed invention except "the ejection failure detecting means judges that an air bubble has intruded into the cavity as a cause of the ejection failure in the case where the subtraction result is smaller than a first threshold."

50. Yamaguchi et al. teach "the ejection failure detecting means judges that an air bubble has intruded into the cavity as a cause of the ejection failure in the case where the subtraction result is smaller than a first threshold (col 6 ln 26-33)." It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to include judging that an air bubble exists in the cavity as a cause of error. One would have been motivated to modify Fujii et al. in view of Takazawa et al. and Nishida et al. for the benefit of determining a cause of error to be corrected in order to create a more robust and higher quality error detection system that not only detects, but also identifies an error cause.

51. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. in view of Takazawa et al. and Nishida et al. and further in view of Noyes et al. Fujii et al. in view of Takazawa et al. and Nishida et al. disclose the claimed invention as set forth above with respect to claim 8. Thus Fujii et al. in view of Takazawa et al. and Nishida et al. meet the claimed invention except "the ejection failure detecting means judges that the liquid in the vicinity of the nozzle has thickened due to drying as a cause

of the ejection failure in the case where the subtraction result is larger than a second threshold.”

52. Noyes et al. teach “the ejection failure detecting means judges that the liquid in the vicinity of the nozzle has thickened due to drying as a cause of the ejection failure in the case where the subtraction result is larger than a second threshold (col 80 ln 12-23).” It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to include judging that liquid has thickened due to drying as a cause of error. One would have been motivated to modify Fujii et al. in view of Takazawa et al. and Nishida et al. for the benefit of determining a cause of error to be corrected in order to create a more robust and higher quality error detection system that not only detects, but also identifies an error cause.

53. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. in view of Takazawa et al. and Nishida et al. and further in view of Fujii. Fujii et al. in view of Takazawa et al. and Nishida et al. disclose the claimed invention as set forth above with respect to claim 8. Thus Fujii et al. in view of Takazawa et al. and Nishida et al. meet the claimed invention except “the ejection failure detecting means judges that the liquid in the vicinity of the nozzle has thickened due to drying as a cause of the ejection failure in the case where the subtraction result is larger than a second threshold.”

54. Fujii teaches “the ejection failure detecting means judges that the liquid in the vicinity of the nozzle has thickened due to drying as a cause of the ejection failure in the case where the subtraction result is larger than a second threshold (col 2 ln 5-27).” It

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would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to include judging that liquid has thickened due to drying as a cause of error. One would have been motivated to modify Fujii et al. in view of Takazawa et al. and Nishida et al. for the benefit of determining a cause of error to be corrected in order to create a more robust and higher quality error detection system that not only detects, but also identifies an error cause.

55. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. in view of Takazawa et al., Nishida et al., and Noyes et al. or Fujii and further in view of Yamaguchi et al. Fujii et al. in view of Takazawa et al., Nishida et al., and Noyes et al. or Fujii disclose the claimed invention as set forth above with respect to claim 10. Thus Fujii et al. in view of Takazawa et al., Nishida et al., and Noyes et al. or Fujii meet the claimed invention except "the ejection failure detecting means judges that paper dust is adhering in the vicinity of the outlet of the nozzle as a cause of the ejection failure in the case where the subtraction result is smaller than the second threshold and larger than a third threshold."

56. Yamaguchi et al. teach "the ejection failure detecting means judges that paper dust is adhering in the vicinity of the outlet of the nozzle as a cause of the ejection failure in the case where the subtraction result is smaller than the second threshold and larger than a third threshold (col 5 ln 45-57)." It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to include judging that paper dust is adhering to the nozzle as a cause of error. One would have been motivated to modify Fujii et al. in view of Takazawa et al., Nishida et al., and Noyes et

al. or Fujii for the benefit of determining a cause of error to be corrected in order to create a more robust and higher quality error detection system that not only detects, but also identifies an error cause.

57. Claim 13 is rejected under 35 U.S.C. 103(a) as being obvious over Fujii et al. in view of Takazawa et al. and further in view of Sakagami et al. (US 20040239714).

58. The applied reference has a common inventor with the instant application.

Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(I)(1) and § 706.02(I)(2).

59. Fujii et al. in view of Takazawa et al. disclose the claimed invention as set forth above with respect to claim 1. Thus Fujii et al. in view of Takazawa et al. meet the claimed invention except "switching means for switching a connection of the actuator

from the driving circuit to the ejection failure detecting means after carrying out a droplet ejection operation by driving the actuator.”

60. Sakagami et al. teach “switching means for switching a connection of the actuator from the driving circuit to the ejection failure detecting means after carrying out a droplet ejection operation by driving the actuator (Par [0173]).” It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to include a switching means to switch between driving and ejection failure detection. One would have been motivated to modify Fujii et al. in view of Takazawa et al. for the benefit of creating a more efficient and higher quality printing apparatus by using the actuator for the driving circuit and ejection failure detection.

61. Claims 14-18 are rejected under 35 U.S.C. 103(a) as being obvious over Fujii et al. in view of Takazawa et al. and further in view of Sakagami et al. (US 20050122360).

62. The applied reference has a common inventor with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention “by another”; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the

application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

63. Fujii et al. in view of Takazawa et al. disclose the claimed invention as set forth above with respect to claim 1. Thus Fujii et al. in view of Takazawa et al. meet the claimed invention except:

64. Regarding claim 14, "the ejection failure detecting means includes an oscillation circuit and the oscillation circuit oscillates in response to an electric capacitance component of the actuator that varies with the residual vibration of the diaphragm."

65. Regarding claim 15, "the ejection failure detecting means includes a resistor element connected to the actuator, and the oscillation circuit forms a CR oscillation circuit based on the electric capacitance component of the actuator and a resistance component of the resistor element."

66. Regarding claim 16, "the ejection failure detecting means includes an F/V converting circuit that generates a voltage waveform in response to the residual vibration of the diaphragm from a predetermined group of signals generated based on changes in an oscillation frequency of an output signal from the oscillation circuit."

67. Regarding claim 17, "the ejection failure detecting means includes a waveform shaping circuit that shapes the voltage waveform in response to the residual vibration of the diaphragm generated by the F/V converting circuit into a predetermined waveform."

68. Regarding claim 18, “the waveform shaping circuit includes: DC component eliminating means for eliminating a direct current component from the voltage waveform of the residual vibration of the diaphragm generated by the F/V converting circuit; and a comparator that compares the voltage waveform from which the direct current component thereof has been eliminated by the DC component eliminating means with a predetermined voltage value; and wherein the comparator generates and outputs a rectangular wave based on this voltage comparison.”

69. Sakagami et al. teach:

70. Regarding claim 14, “the ejection failure detecting means includes an oscillation circuit and the oscillation circuit oscillates in response to an electric capacitance component of the actuator that varies with the residual vibration of the diaphragm (Par [0024]).”

71. Regarding claim 15, “the ejection failure detecting means includes a resistor element connected to the actuator, and the oscillation circuit forms a CR oscillation circuit based on the electric capacitance component of the actuator and a resistance component of the resistor element (Par [0024]).”

72. Regarding claim 16, “the ejection failure detecting means includes an F/V converting circuit that generates a voltage waveform in response to the residual vibration of the diaphragm from a predetermined group of signals generated based on changes in an oscillation frequency of an output signal from the oscillation circuit (Par [0026]).”

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73. Regarding claim 17, "the ejection failure detecting means includes a waveform shaping circuit that shapes the voltage waveform in response to the residual vibration of the diaphragm generated by the F/V converting circuit into a predetermined waveform (Par [0026])."

74. Regarding claim 18, "the waveform shaping circuit includes: DC component eliminating means for eliminating a direct current component from the voltage waveform of the residual vibration of the diaphragm generated by the F/V converting circuit; and a comparator that compares the voltage waveform from which the direct current component thereof has been eliminated by the DC component eliminating means with a predetermined voltage value; and wherein the comparator generates and outputs a rectangular wave based on this voltage comparison (Par [0027])."

75. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the droplet ejection apparatus of Fujii et al. in view of Takazawa et al. as modified with the disclosure of Sakagami et al. in order to create a higher quality printing apparatus with a more robust and accurate ejection failure detection means that includes an oscillation circuit with a resistor, and F/V converting circuit, and a waveform shaping circuit.

76. Claims 20, 22, 24, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. in view of Takazawa et al. and further in view of Nakazawa et al. (US 6174038).

77. Regarding claim 20, Fujii et al. in view of Takazawa et al. disclose the claimed invention as set forth above with respect to claim 1. Thus Fujii et al. in view of

Takazawa et al. meet the claimed invention except "the actuator includes a piezoelectric actuator having a piezoelectric element and using a piezoelectric effect of the piezoelectric element."

78. Nakazawa et al. teach "the actuator includes a piezoelectric actuator having a piezoelectric element and using a piezoelectric effect of the piezoelectric element (col 5 ln 44-46)." It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to interchange the piezoelectric actuator taught by Nakazawa et al. and the electrostatic actuator disclosed by Fujii et al. One would have been motivated to modify Fujii et al. in view of Takazawa et al. for the benefit of obtaining higher accuracy or the capability of using higher voltages both of which are provided by the properties of a piezoelectric element over an electrostatic element.

79. Regarding claim 22, Fujii et al. disclose "a cavity filled with a liquid (6 of Fig 1); a nozzle communicated with the cavity (4 of Fig 1); and a[n]...actuator (27 of Fig 5) for varying a pressure of the liquid filled in the cavity, the liquid being ejected through the nozzle in the form of droplets in response to the variation of the pressure (col 14 ln 54-56); a driving circuit (40 of Fig 1, 6, 7A) which drives the...actuator of each droplet ejection head; pulse generating means for generating reference pulses (63 of Fig 6); a counter for counting the number of reference pulses generated for a predetermined time period (91 of Fig 28)." Thus Fujii et al. disclose the claimed invention except "a piezoelectric actuator" and "ejection failure detecting means for detecting an ejection failure of the droplets on the basis of the count value of the counter counted for the predetermined time period."

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80. Takazawa et al. teach "ejection failure detecting means for detecting an ejection failure of the droplets on the basis of the count value of the counter counted for the predetermined time period (741, Par [0101], Fig 5)." It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to include ejection failure detecting means. One would have been motivated to modify Fujii et al. for the benefit of having the ability to detect and correct errors in order to achieve a more accurate and reliable printing system.

81. Nakazawa et al. teach "a piezoelectric actuator (col 5 ln 44-46)." It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to interchange the piezoelectric actuator taught by Nakazawa et al. and the electrostatic actuator disclosed by Fujii et al. One would have been motivated to modify Fujii et al. in view of Takazawa et al. for the benefit of obtaining higher accuracy or the capability of using higher voltages both of which are provided by the properties of a piezoelectric element over an electrostatic element.

82. Regarding claim 24, Fujii et al. further disclose "wherein the droplet ejection apparatus includes an ink jet printer (see Fig 33)."

83. Regarding claim 27, the method steps are disclosed by Fujii et al. in view of Takazawa et al. and further in view of Nakazawa as set forth above, to be performed by, the apparatus of claim 22.

84. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. in view of Takazawa et al. and Nakazawa and further in view of Fujii et al. (US 20010007460). Fujii et al. in view of Takazawa et al. and Nakazawa disclose the

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claimed invention as set forth above with respect to claim 22. Thus Fujii et al. in view of Takazawa et al. and Nakazawa meet the claimed invention except “the predetermined time period is a time period until the residual vibration of an electromotive voltage of the piezoelectric actuator is generated after the droplet has been normally ejected from the droplet ejection head.”

85. Fujii et al. teach “the predetermined time period is a time period until the residual vibration of an electromotive voltage of the...actuator is generated after the droplet has been normally ejected from the droplet ejection head (Par [0107]).” It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to have the predetermined time period be a time period until residual vibration. One would have been motivated to modify Fujii et al. in view of Takazawa et al. and Nakazawa for the benefit of ensuring that the printing system operates efficiently and that ink droplets can be formed stably resulting in a higher quality printer as set forth by Fujii et al. in paragraphs [0107] and [0108].”

86. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. in view of Takazawa et al. and Nakazawa and further in view of Nishihara. Fujii et al. in view of Takazawa et al. and Nakazawa disclose the claimed invention as set forth above with respect to claim 22. Thus Fujii et al. in view of Takazawa et al. and Nakazawa meet the claimed invention except “the predetermined time period is a time period until the residual vibration of an electromotive voltage of the piezoelectric actuator is generated after the droplet has been normally ejected from the droplet ejection head.”

87. Nishihara teaches “the predetermined time period is a time period until the residual vibration of an electromotive voltage of the...actuator is generated after the droplet has been normally ejected from the droplet ejection head (Par [0012], [0130]).”

It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to include an ejection failure detecting step with the predetermined time period being a time period until residual vibration. One would have been motivated to modify Fujii et al. for the benefit of having the ability to detect and correct errors in order to achieve a more accurate and reliable printing system while operating efficiently and forming ink droplets more stably resulting in higher quality.

88. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. in view of Takazawa et al. and further in view of Nishida et al. Fujii et al. in view of Takazawa et al. disclose the claimed invention as set forth above with respect to claim 25. Thus Fujii et al. in view of Takazawa et al. meet the claimed invention except “the counting step includes subtracting the number of reference pulses counted f or the predetermined time period from a predetermined reference value; and wherein the ejection failure detecting step includes detecting the ejection failure on the basis of the subtraction result.”

89. Nishida et al. teach “the counting step includes subtracting the number of reference pulses counted f or the predetermined time period from a predetermined reference value; and wherein the ejection failure detecting step includes detecting the ejection failure on the basis of the subtraction result (Par [0204]).” It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to

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include a subtraction capability of the counter as the basis for detecting the error. One would have been motivated to modify Fujii et al. in view of Takazawa et al. for the benefit of creating a more robust and higher quality sensing system by using a reference as a "normal".

Double Patenting

90. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

91. Claims 1-27 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1 and 3; 1 and 3; 9; 10; 11 and 12; 13 and 14; 19; 4; 13 and 14; 19; 16; 5; 40; 42; 43; 44; 45; 46; 47; 48; 49; 1, 3 and 48; 1, 3, and 48; 49; 1 and 3; 4; 1, 3, and 48, respectively of copending Application No. 10/824335. Although the conflicting claims are not identical, they are

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not patentably distinct from each other because all of the claim elements of the instant application are contained in the claims of the copending application as set forth above.


This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian Goldberg whose telephone number is 571-272-2728. The examiner can normally be reached on Monday through Friday, 9AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vip Patel can be reached on 571-272-2458. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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